

Wisconsin's Forest Resources



Acreage of timberland in Wisconsin is increasing and currently stands at about 16.5 million acres. Most forest land is located in the northern and central parts of the state and is privately-owned. Our forests are aging with major increases in stands 60 to 100 years old. Since 2004, there has also been an increase in acres of very young and very old forest. Oak-hickory, maple-beech-birch and aspen forest types account for 2/3 of all forest land.

The volume of wood is increasing with over 21.8 billion cubic feet in 2015. The species with the highest volume are sugar maple, red maple and aspen. Since 1996, growth rates have increased at a greater pace than volume whereas mortality has increased at a rate higher than growth or volume. Removals have remained static since 1996.

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"How have Wisconsin's forests changed?"

Acreage by stand age class, forest type and size class

There were about 16.5 million acres of [timberland](#) in Wisconsin in 2015. This is an increase of 1.8 million acres since 1983 and 845,000 acres since 1996. Most of this increase has been in central and southeast Wisconsin.

About two-thirds of all timberland is classified as either maple- beech- birch, oak- hickory or aspen- birch [forest type](#) (Figure 1). Since 1938, the acreage in aspen-birch has decreased by over 2 million acres and the acreage of oak-hickory has increased by over 2 million acres. Acreage in maple- beech- birch and elm-ash-cottonwood has increased by over 1 million acres each.

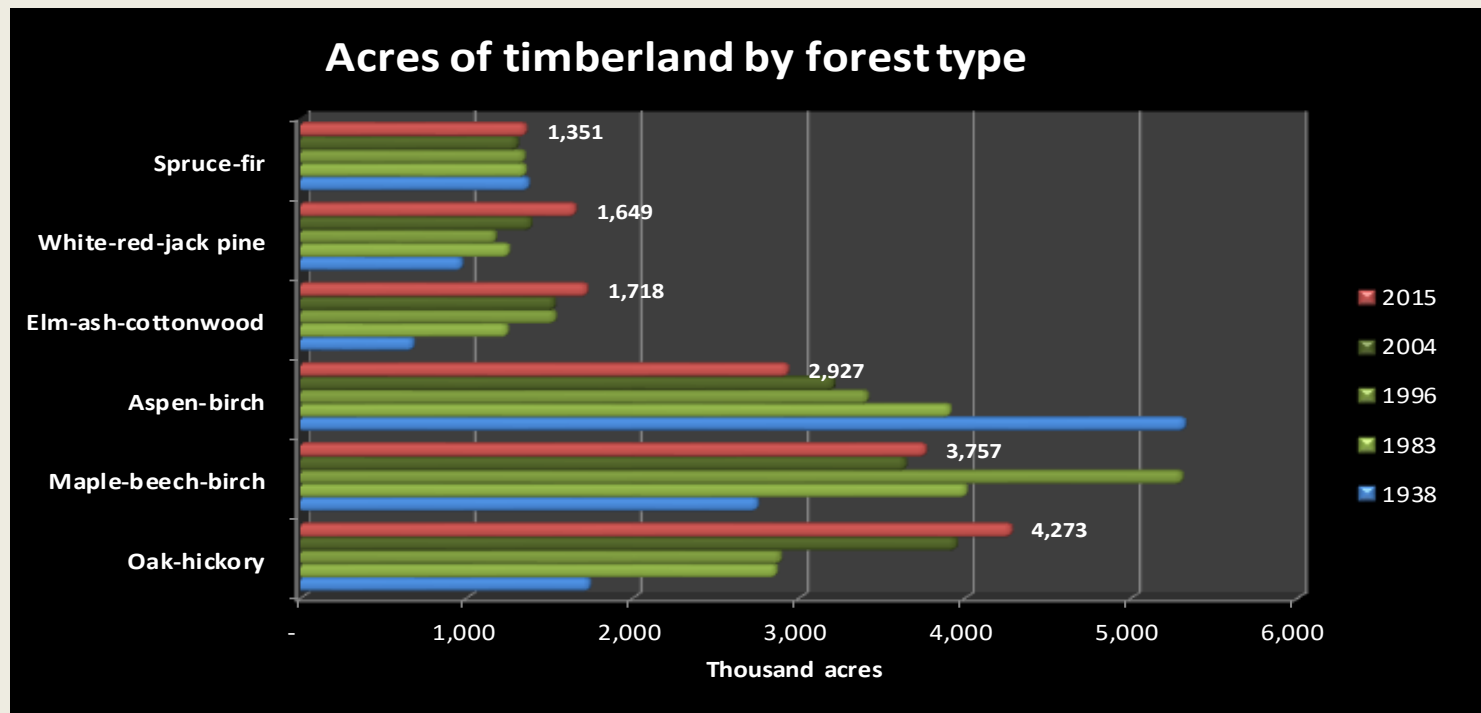


Figure 1. Acreage of timberland by forest type and inventory year (USDA Forest Service, Forest Inventory & Analysis).

For a table of acreage by forest type and county, go to:
[Timberland acreage by forest type group and county](#)

Since 1968, Wisconsin's forests have become more middle-aged with fewer acres in the very youngest and very oldest age classes (Figure 2). For example, from 1968 to 2015, acreage in stands 40 years old or less decreased from 50% of all acres to only 27%. But this trend may be changing. Since 2004, acreage in young stands (less than 20 years old) has increased 8% and acreage in stands over 100 years old has increased by 66%.

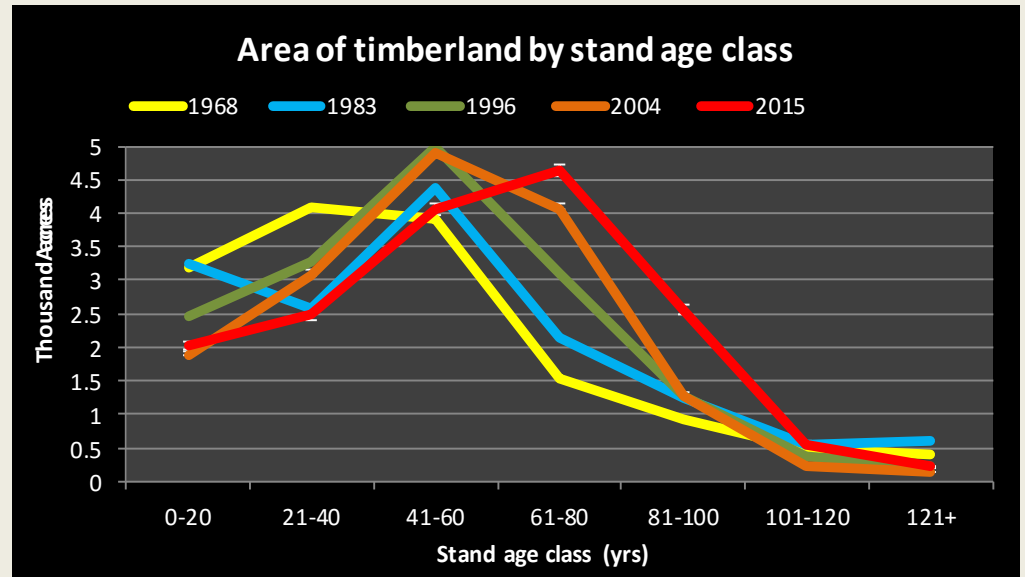


Figure 2. Acreage of timberland by stand age class and inventory year (USDA Forest Service, Forest Inventory & Analysis)

The distribution of acreage by [stand size class](#) reflects the same process of forest maturation (Figure 3). Between 1968 and 2015, the area in [sawtimber stands](#) increased by over 4 million acres or 139% whereas the acreage in [seedling/sapling](#) stands decreased by 24%.

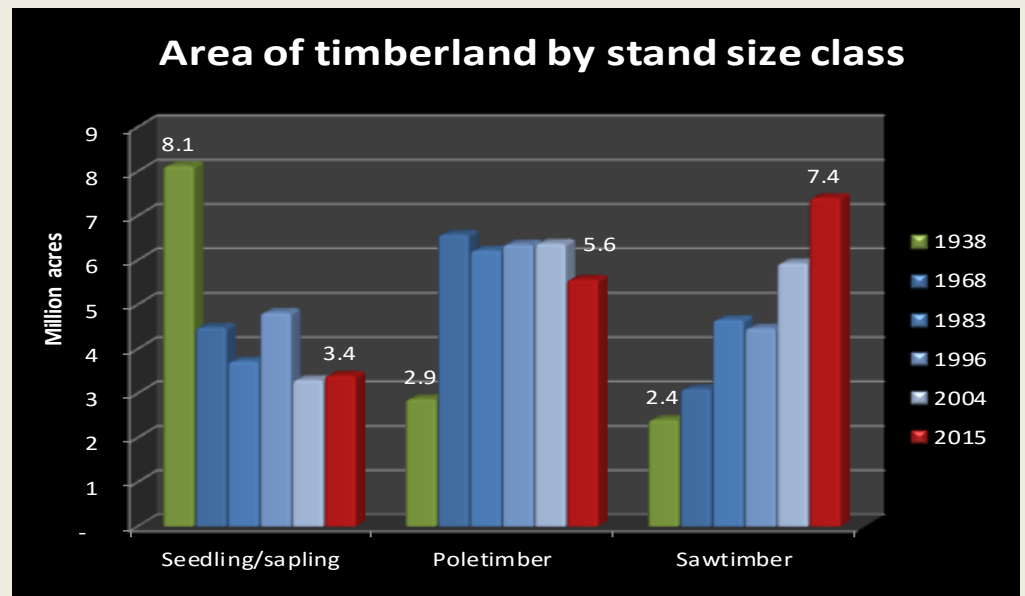


Figure 3. Acreage of timberland by stand size class and inventory year (USDA Forest Service, Forest Inventory & Analysis)

For tables of stand age and size class by county go to:

[Acreage of timberland by stand age class and county](#)

[Acreage of timberland by stand size class and county](#)

"What are the major species and how have they changed?"

Growing stock volume by major species

There are 21.8 billion cubic feet of wood in Wisconsin's forests. The greatest growing stock volume by species is sugar maple where volume has increased by 60% since 1983. The second highest is red maple where volume has doubled since 1983.

The greatest percentage volume gains since 1983 have been in black walnut (435%), white pine (211%), tamarack (139%), red pine (125%), red maple (96%), ash (96%) and the white oak group (64%, white oak, bur oak, swamp white oak). The greatest percentage **volume losses** in the since 1983 have been in jack pine (-57%), paper birch (-54%), balsam fir (-26%), elm (-25%) and aspen (-13%).

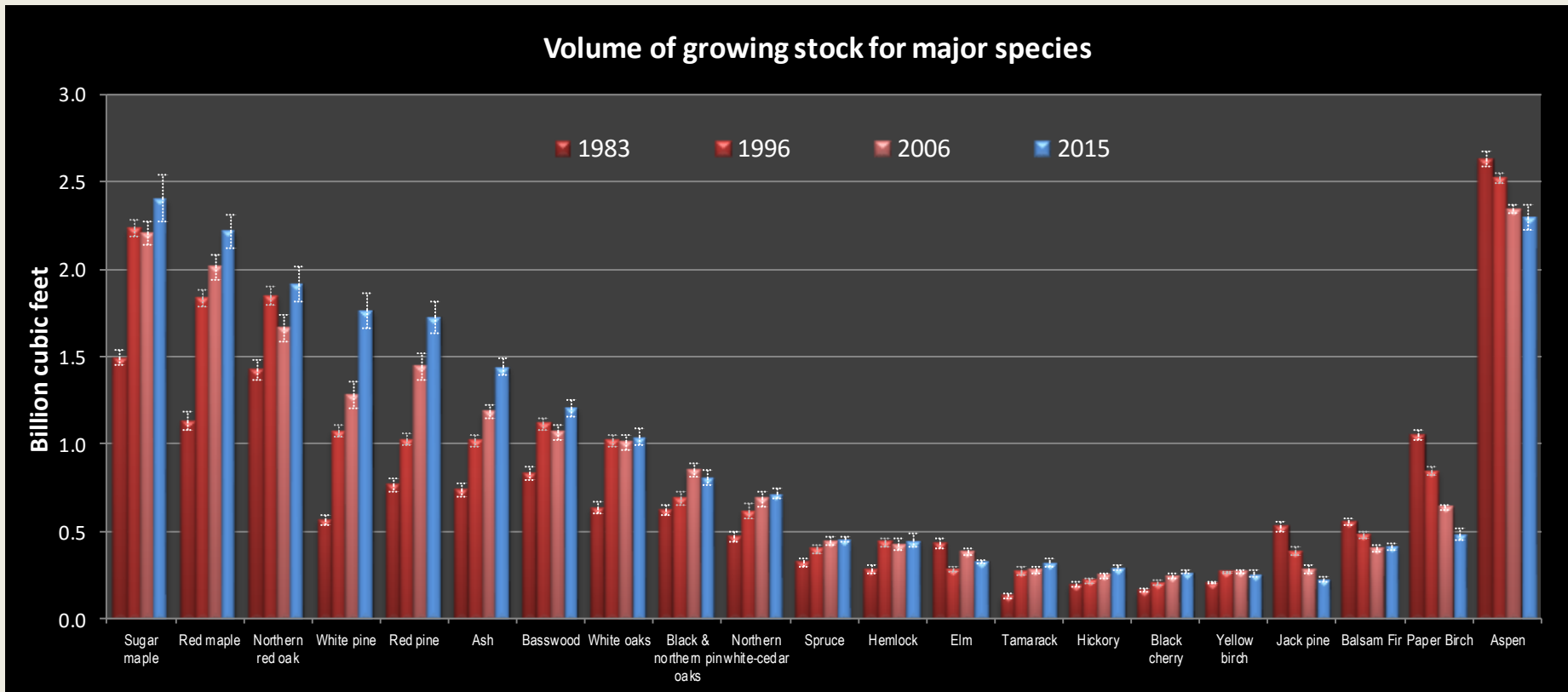


Figure 4. Volume of growing stock (billion cubic feet) by species and inventory year (USDA Forest Service, Forest Inventory & Analysis)



“Who owns Wisconsin’s forests?” Timberland ownership by group

About **one third of Wisconsin’s timberland is owned by the public**: federal, state, county and municipal governments (Figure 5). Over half is owned by private individuals and 12% by corporate and other private entities.

Acreage of timberland by owner group

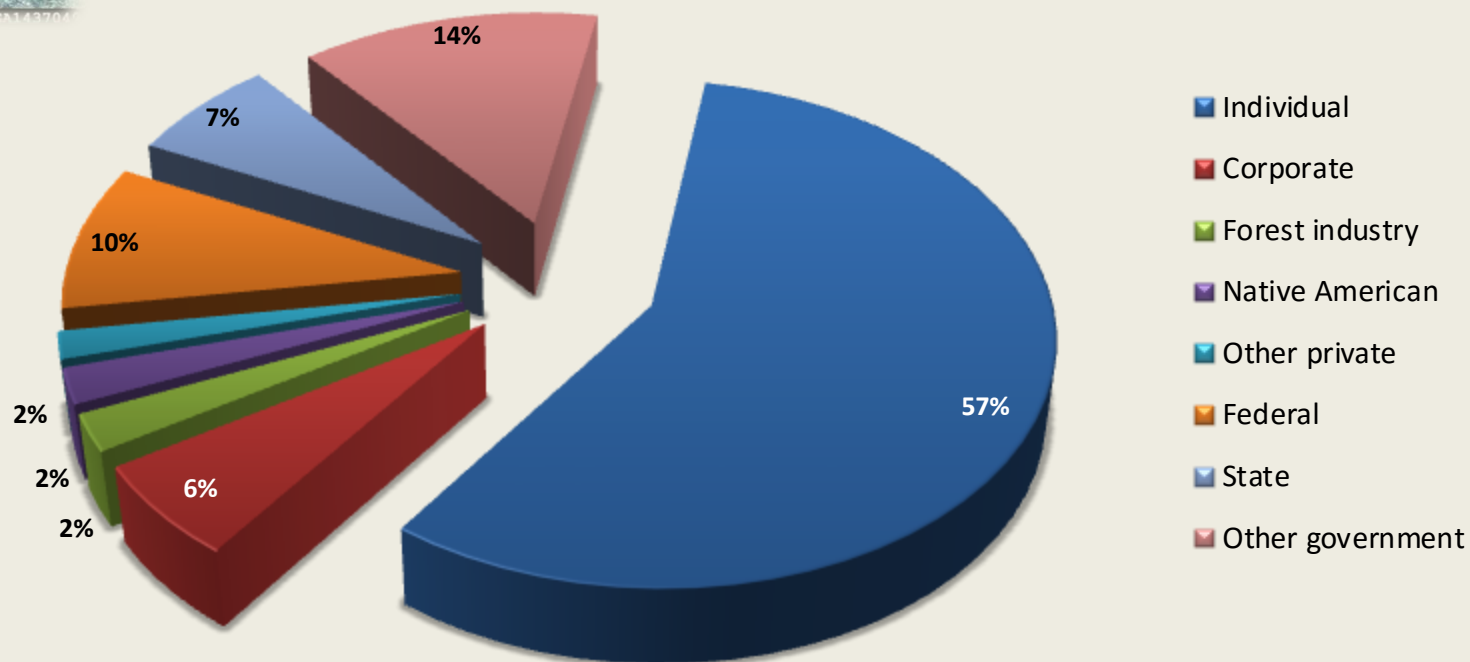


Figure 5. Acreage of timberland by owner group (USDA Forest Service, Forest Inventory & Analysis)

For a table of **Acreage of timberland by owner class and county** go to:
[Acres of timberland by owner class and county](#)

“What types of forests do we have?”

Acreage and map of Wisconsin’s timberland by forest type

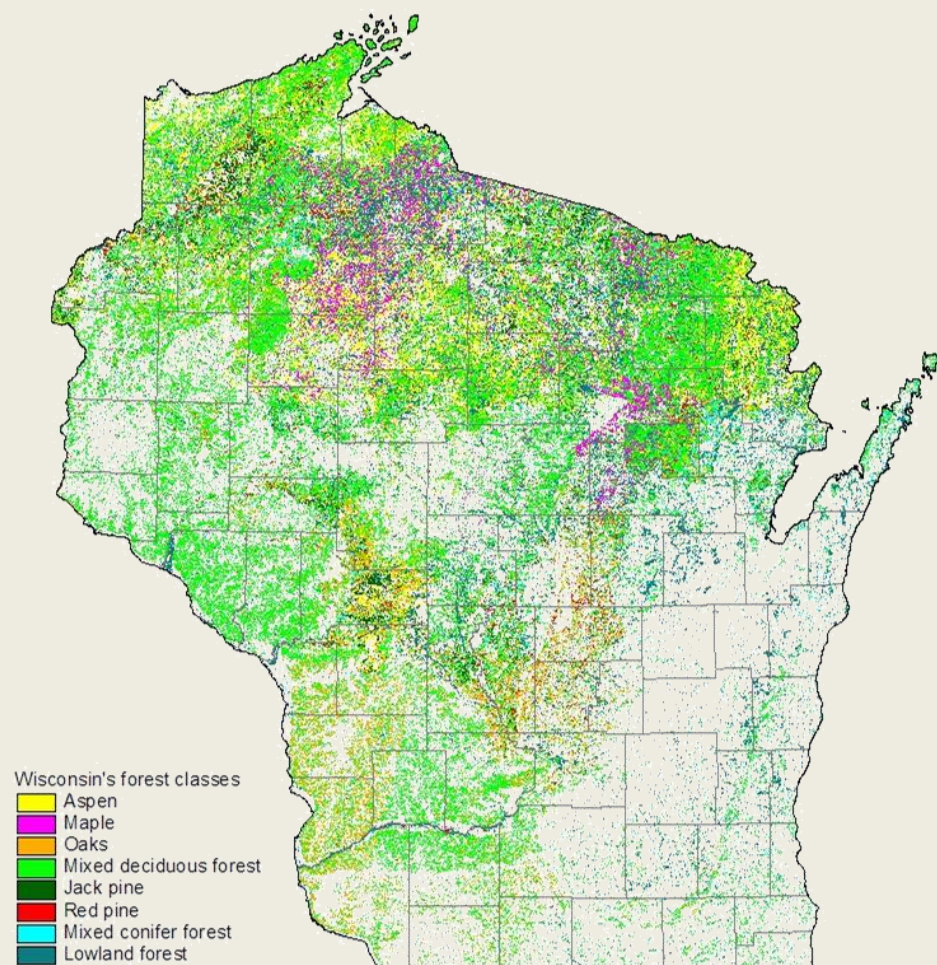
Wisconsin’s forests are located mostly in the northern and central parts of the state (Table 1, map). Pine and oak-pine predominate in the sandy soils of central, northwest and northeast Wisconsin. Oak-hickory [forest type](#) occurs mostly in the southwest and central parts of the state. Aspen-birch, maple-basswood and spruce fir are primarily northern forest types. Bottomland hardwoods are distributed throughout the state in low-lying areas.

Table 1. Acres (1,000) of timberland by major forest type and region of the state

Forest type group	North east	North west	Central	South west	South east	Total
Oak-hickory	367	922	1,200	1,315	470	4,273
Maple-beech-birch	1,420	1,474	364	307	192	3,757
Aspen-birch	925	1,464	356	124	57	2,927
Elm-ash-cottonwood	339	473	336	215	357	1,718
White-red- jack pine	471	445	576	82	75	1,649
Spruce-fir	624	526	124	6	71	1,351
Oak-pine	149	147	202	26	26	550
Minor types*	42	76	92	48	63	321
Total	4,336	5,526	3,249	2,122	1,312	16,546

* Includes nonstocked land, exotic hardwoods and exotic softwoods.

Source: USDA Forest Service, Forest Inventory & Analysis data



Source: WISLAND land cover, Wisconsin Dept. of Natural Resources, 1998



“How much wood do we have?”

Growing stock volume by species and year

Table 2. Growing stock volume in million cubic feet on timberland.

Species group	1983	1996	2006	2015	Change since 1983
Sugar maple	1,494	2,234	2,205	2,407	61%
Aspen	2,628	2,520	2,342	2,296	-13%
Red maple	1,132	1,834	2,013	2,218	96%
N red oak	1,423	1,845	1,665	1,915	35%
White pine	567	1,073	1,282	1,765	211%
Red pine	766	1,024	1,443	1,726	125%
Ash	738	1,021	1,184	1,443	96%
Basswood	836	1,117	1,068	1,209	45%
White oaks	633	1,021	1,010	1,042	65%
Black & N pin oaks	627	688	848	808	29%
N white-cedar	472	617	686	718	52%
Paper Birch	1,053	845	639	481	-54%
Spruce	325	399	443	458	41%
Hemlock	284	439	425	451	59%
Balsam Fir	556	479	402	413	-26%
Elm	435	284	384	328	-25%
Tamarack	134	270	279	325	143%
Hickory	194	220	250	294	52%
Black cherry	164	207	246	269	64%
Yellow birch	208	266	271	258	24%
Jack pine	526	388	283	226	-57%
Black walnut	23	50	84	115	400%
Minor species	200	322	383	595	111%
Total	15,417	19,164	19,835	21,800	40%

Source: USDA Forest Service, Forest Inventory & Analysis

Wisconsin has 21.8 billion cubic feet of [growing stock volume](#) in trees over 5 inches in diameter, an increase of 39% since 1983 (Figure 6). The volume of white pine has tripled and the volume of red maple, tamarack and red pine has doubled since 1983 (Table 2). Ash, white oak, hemlock, black cherry and sugar maple volume has also increased by over 50%. The volume of black walnut has increased fivefold.

Jack pine and paper birch have undergone the largest decrease in volume in the last three decades. Balsam fir, elm and aspen also have shown declines.

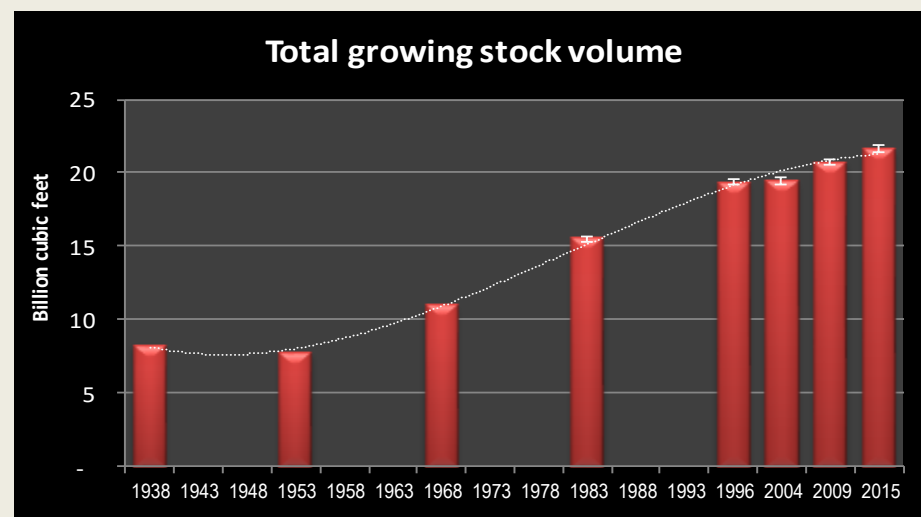


Figure 6. Volume of growing stock (billion cubic feet) by inventory year (USDA Forest Service, Forest Inventory & Analysis).

“How fast are our forests growing?”

Average annual net growth by species and year

[Average annual net growth](#) has increased about 17% since 1983 to 574 million cubic feet (Figure 7). The average ratio of growth to volume is 2.6% statewide but some species surpass this.

Black walnut, red pine, eastern white pine, American beech and red maple have the highest growth to volume ratios. Paper birch, elm, yellow birch, black oak and northern pin oak have growth ratios far below average. High mortality will decrease net growth significantly (net growth is equal to gross growth minus mortality) as is the case with aspen, elm, paper birch, black and northern pin oaks and balsam fir.

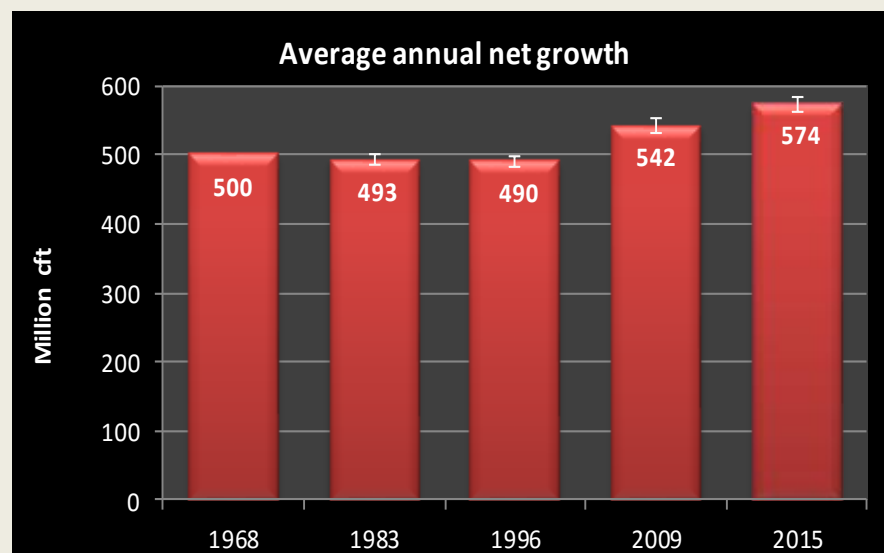


Figure 7. Average annual net growth of growing stock by inventory year (USDA Forest Service, Forest Inventory & Analysis).

Table 3. Growing stock volume net growth and the ratio of growth to volume by species.

Species	Growing stock volume (million cft)	Average annual net growth (million cft)	Ratio of growth to volume
Black walnut	121	6.0	4.9%
Red pine	1,726	73.0	4.2%
White pine	1,765	72.1	4.1%
Beech	34	1.0	3.1%
Red maple	2,466	73.0	3.0%
Aspen	2,296	67.0	2.9%
Black cherry	269	7.7	2.9%
Hickory	294	8.2	2.8%
N red oak	1,915	53.4	2.8%
Ash	1,443	39.6	2.7%
Tamarack	325	8.9	2.7%
Jack pine	226	5.4	2.4%
Sugar maple	2,407	55.1	2.3%
Balsam Fir	413	9.2	2.2%
Basswood	1,209	24.8	2.1%
N white-cedar	718	15.1	2.1%
Spruce	458	8.9	1.9%
White oaks	1,042	18.4	1.8%
Hemlock	451	6.7	1.5%
Black & N pin oaks	808	9.2	1.1%
Yellow birch	258	2.4	0.9%
Elm	328	2.1	0.6%
Paper Birch	481	-4.3	-0.9%
Minor species	595	11.2	4.2%
Total	21,800	574.1	2.6%

“How healthy are our forests?”

Average annual mortality by species and year

Table 4. Annual mortality, gross growth of growing stock (million cubic feet) and the ratio of mortality to growth by species.

Species group	Annual mortality (million cft)	Volume of growing stock (million cft)	Ratio of mortality to volume
Elm	21.1	328	6.4%
Balsam Fir	17.7	413	4.3%
Paper Birch	19.7	481	4.1%
Jack pine	7.1	226	3.1%
Aspen	66.8	2,296	2.9%
Black & N pin oaks	17.2	808	2.1%
Spruce	8.5	458	1.9%
Black cherry	4.2	269	1.6%
Yellow birch	3.3	258	1.3%
Tamarack	2.8	325	0.9%
Hemlock	3.3	451	0.7%
Ash	10.1	1,443	0.7%
Hickory	2.0	294	0.7%
Basswood	7.5	1,209	0.6%
White oaks	5.4	1,042	0.5%
Northern red oak	7.9	1,915	0.4%
Beech	0.1	34	0.4%
Red maple	8.4	2,218	0.4%
White pine	5.3	1,765	0.3%
Northern white-cedar	1.8	718	0.2%
Sugar maple	5.5	2,407	0.2%
Red pine	2.8	1,726	0.2%
Black walnut	0.0	121	0.0%
Minor species	6.0	595	2.2%
Total	234.8	21,801	1.1%

Source: USDA Forest Service, Forest Inventory & Analysis

Average annual mortality has increased at a faster pace than volume since 1996 and is currently 234 million cubic feet per year. Volume increased 12.7% but mortality increased by 23.9% (Figure 8). Over 1% of all volume is lost to mortality (Table 4). Certain species have experienced elevated mortality, especially elm, balsam fir, paper birch, jack pine, aspen, black oak and northern pin oak.

The species with the lowest ratio of mortality to volume are black walnut, red pine, sugar maple, northern white-cedar, eastern white pine, red maple, American beech and northern red oak.

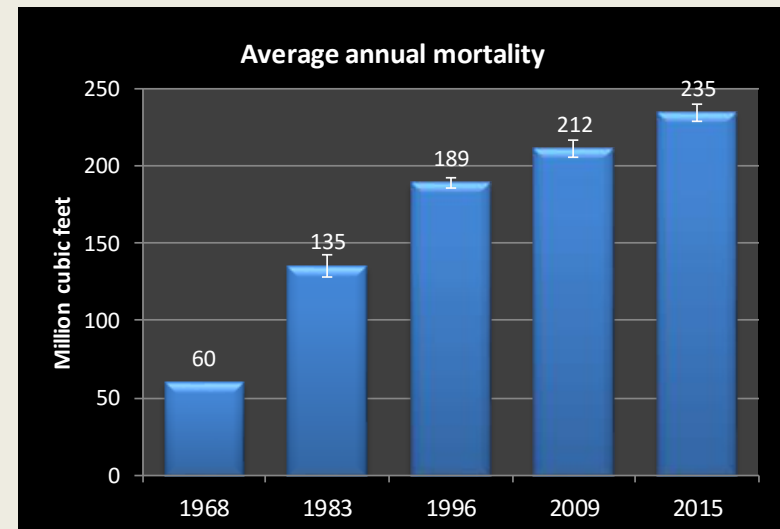


Figure 8. Average annual mortality by inventory year (USDA Forest Service, Forest Inventory & Analysis).



“How much wood do we harvest?”

Average annual removals by species and year

On average, we harvest 304.5 million cubic feet annually, down from 332 million cubic feet in 1996 (Figure 9). This is about half of annual growth.

Average annual removals for paper birch, jack pine, black and northern pin oaks, yellow birch, elm and aspen equaled or exceeded annual growth (Table 5). Most of this is due to high mortality causing low net growth. The species with the highest growth to removals ratio include tamarack, white-cedar, eastern white pine, American beech, hickory, ash and northern red oak due to both low removals and high growth rates.

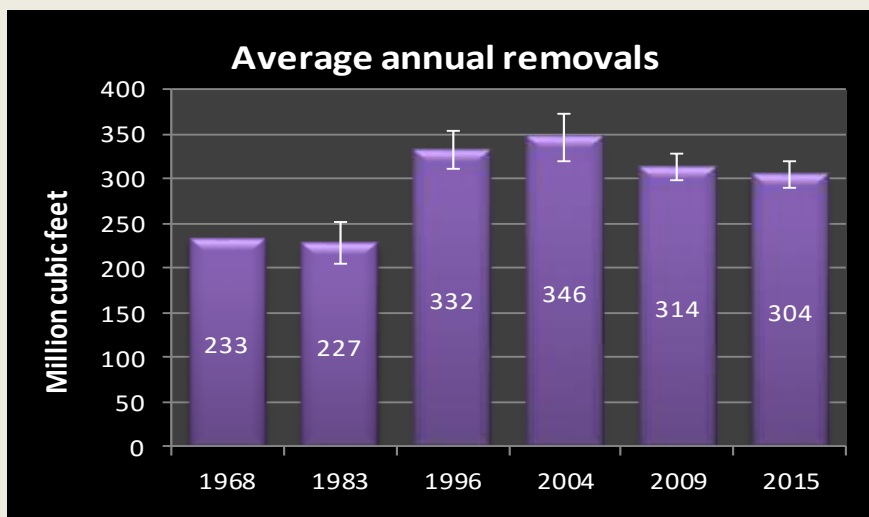


Figure9. Average annual removals (million cubic feet) of growing stock by inventory year (USDA Forest Service, Forest Inventory & Analysis).

Table 5. Average annual removals, net growth and the ratio of growth to removals.

Species group	Annual removals (million cft)	Annual net growth (million cft)	Ratio of growth to removals
Tamarack	1.2	8.9	7.2
N white-cedar	2.3	15.1	6.4
White pine	11.9	72.1	6.1
Beech	0.3	1.0	3.7
Hickory	2.3	8.2	3.6
Ash	12.3	39.6	3.2
N red oak	17.8	53.4	3.0
Black cherry	2.9	7.7	2.7
Black walnut	2.2	6.0	2.7
Hemlock	2.6	6.7	2.6
Sugar maple	23.6	55.1	2.3
Red maple	32.9	73.0	2.2
White oaks	8.4	18.4	2.2
Basswood	12.6	24.8	2.0
Red pine	37.5	73.0	1.9
Spruce	5.3	8.9	1.7
Balsam Fir	6.1	9.2	1.5
Yellow birch	2.2	2.4	1.1
Aspen	67.0	67.0	1.0
Elm	2.4	2.1	0.9
Black & N pin oaks	19.1	9.2	0.5
Jack pine	9.9	5.4	0.5
Paper Birch	13.1	-4.3	(0.3)
Minor species	8.7	11.2	1.3
Grand Total	304.5	574.1	1.9

Source: USDA Forest Service, Forest Inventory & Analysis

“How much biomass do our forests produce?”
Short tons of aboveground biomass by species and year

Table 6. Wood properties and biomass by species group

Species group	Specific gravity of wood*	Ovendry weight of wood (lb/cf)*	Biomass 2015**
Hickory	0.72	45	11.7
White oaks	0.68	42.4	40.7
Beech	0.64	39.9	1.2
N red oak	0.63	39.3	61.2
Sugar maple	0.63	39.3	83.6
Yellow birch	0.62	38.7	10.7
Black & N pin oaks	0.61	38.1	33.8
Ash	0.55	34.3	46.1
Black walnut	0.55	34.3	3.6
Paper Birch	0.55	34.3	16.1
Red maple	0.54	33.7	72.3
Tamarack	0.53	33.1	8.8
Black cherry	0.5	31.2	11.6
Elm	0.5	31.2	12.7
Red pine	0.46	28.7	31.9
Spruce	0.43	27	10.7
Jack pine	0.43	26.8	5.5
Hemlock	0.4	25	9.6
Basswood	0.37	23	21.5
Aspen	0.39	22.5	57.3
Balsam Fir	0.35	21.8	11.3
White pine	0.35	21.8	31.1
N white-cedar	0.31	19.3	13.5
Total	0.51	31.4	635

*Source: Miles, P.D.; Smith, W.B. 2009. Specific gravity and other properties of wood and bark for 156 tree species found in North America. Res. Note NRS-38. Newtown Square, PA: USDA, Forest Service, Northern Research Station. 35 p.

** USDA Forest Service, Forest Inventory & Analysis

Wisconsin has about 635 million short tons of aboveground [biomass](#) in its forests (Figure 10). This is the equivalent of approx. 317 million tons of carbon. The amount of biomass has increased 18% since 1996 and 36% since 1983.

The species with the highest biomass to volume ratio are hardwoods, especially hickory, red and white oaks, American beech, sugar maple and ash (Table 6). The species with the lowest ratio are northern white-cedar, balsam fir, aspen, basswood and other conifers.

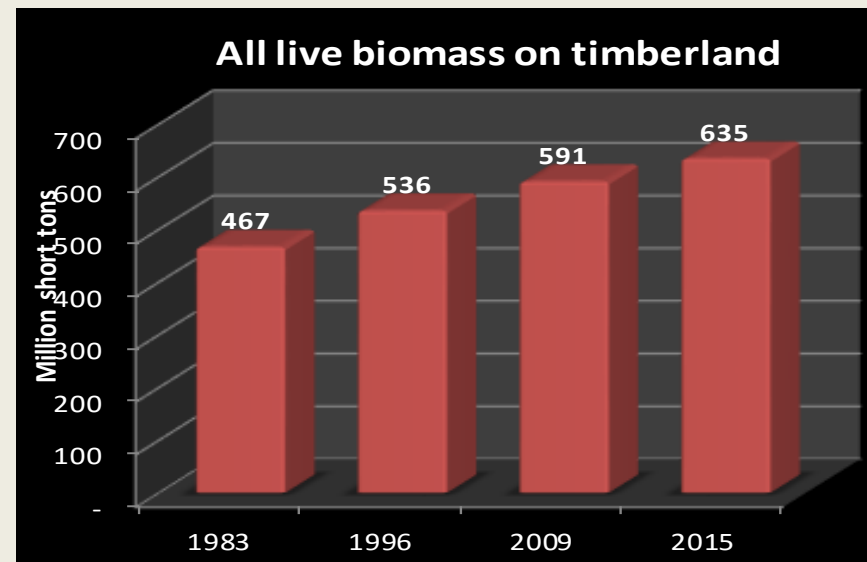


Figure 10. Aboveground biomass (million short tons) in live trees on forest land (USDA Forest Service, Forest Inventory & Analysis).